

# B.Tech I Year

Regular Course Handbook

Subject Name: Prog. for Problem Solving (Unit-4)

**miet**

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Signature	
Name of Subject Head	Ms. Radhika Jindal

Unit 2

Qn1 What is an array? Give an example? (2016-17)

Ans An array is the collection of similar data type elements stored at contiguous memory location.

Syntax:- data-type array-Name[array-size];

Ex:- int marks[5];

Qn2 What are subscript? How they are specified? (2017-18)

Ans Array subscript is an integer type constant or variable name whose value range from 0 to size-1, where size is the total number of element in the array.

Syntax:- Array-Name[subscript]

Qn3 What is array? In which situation array is advantageous over linked list? (2018-19)

Ans An array is the collection of similar data type elements stored at contiguous memory location.

Syntax:- data-type Array-Name[array-size];

Ex:- int marks[5];

Advantage of array over linked list:-

- ① Array allow random access to elements contained within it, whereas linked list only allows sequential access.
- ② Array takes less storage than linked list for storing same number of element.
- ③ Array we is better when the maximum no. of list that can be present are known.

Ques 4- Write an algorithm to find second largest element in an array. (2019-20)

- Ans
- ① Start
  - ② Initialize variable first with value 0
  - ③ Start traversing the array from array [1]
  - a) If the current element in the array say array [i] is greater than first. Then update first and second as:-  
 $\text{second} = \text{first}$   
 $\text{first} = \text{array}[i]$
  - b) If the current element is in between first and second, then update second to store the value of current variable as:  
 $\text{second} = \text{array}[i]$
  - ④ Return the value stored in second.
  - ⑤ Stop.

Ques 5- Write a program to find odd and even number from the array elements and its count. (2020-21)

Ans

```
#include <stdio.h>
int main()
{
    int a[100];
    int n, i, even=0, odd=0;
    printf ("Enter no of elements\n");
    scanf ("%d", &n);
    for( i=0; i<n; i++)
    {
```

```
printf("Enter %d element\n", i+1);
scanf("%d", &a[i]);
}
for(i=0; i<n; i++)
{
    if(a[i] % 2 == 0)
    {
        printf("%d is even\n", a[i]);
        even++;
    }
    else
    {
        printf("%d is odd\n", a[i]);
        odd++;
    }
}
printf("No of odd numbers are %d\n", odd);
printf("No of even numbers are %d\n", even);
return 0;
}
```

M i o d t

Output: Enter no of element

5

Enter 1 element

5

Enter 2 element

6

Enter 3 element

4

Enter 4 element

9

Enter 5 element

3

5 is odd

6 is even

4 is even

9 is odd

3 is odd

No of odd numbers are 3

No of even numbers are 2

## # multidimensional array #

Ques- write a C program to check whether given square matrix is symmetric or not. (2015-16)

#include <stdio.h>

```
int main()
{
    int n, c, d, matrix[10][10], transpose[10][10];
    printf("Enter the number of rows & columns of matrix\n");
    scanf("%d", &n);
    printf("Enter elements of the matrix\n");
    for(c=0; c<n; c++)
    {
        for(d=0; d<n; d++)
        {
            scanf("%d", &matrix[c][d]);
        }
    }
    for(c=0; c<n; c++)
    {
        for(d=0; d<n; d++)
        {
            transpose[d][c] = matrix[c][d];
        }
    }
}
```

```
for( c=0; c<n; c++)
{
    for( d=0; d<n; d++)
    {
        if( matrix[c][d] != transpose[c][d])
            break;
    }
    if( d != n)
        break;
    if( c == n)
        printf("The matrix is symmetric\n");
    else
        printf("matrix is not symmetric\n");
    return 0;
}
```

met

Output: Enter the number of rows & columns of matrix

2

Enter elements of the matrix

2  
4

5  
3

matrix isn't symmetric

Vimp

Ques work a c program to multiply two matrices. Take the size of elements of matrices from the keyboard. (2015-16)  
'or'

work a c program to multiply two matrices and display the resultant matrix (2016-17)

Write a program to multiply two matrices, read size and number of elements of matrices from the keyboard.  
'or'  
(2017-18)

Write a program to multiply 2 matrices of size  $m \times m$ .

#include <stdio.h>

int main()

{

int a[10][10], b[10][10], c[10][10], i, j, k, m, n, p, q;

printf("Enter the order of first matrix");

scanf("%d%d", &m, &n);

printf("Enter the order of second matrix");

scanf("%d%d", &p, &q);

if (n != p)

{

printf("Multiplication not possible");

}

else

{

printf("Enter elements of first matrix\n");

for (i=0; i<m; i++)

{

for (j=0; j<n; j++)

{

scanf("%d", &a[i][j]);

}

}

printf("Enter elements of second matrix\n");

for (i=0; i<p; i++)

{

```
for(j=0; j<q; j++)
{
    scanf("%d", &b[i][j]);
}

for(i=0; i<m; i++)
{
    for(j=0; j<q; j++)
    {
        c[i][j] = 0
        for(k=0; k<n; k++)
        {
            c[i][j] = c[i][j] + a[i][k] * b[k][j];
        }
    }
}

printf("Product of matrices :\n");
for(i=0; i<m; i++)
{
    for(j=0; j<q; j++)
    {
        printf("%d\t", c[i][j]);
    }
    printf("\n");
}

return 0;
```

Output) Enter the order of first matrix 3 3  
 Enter the order of second matrix 3 3  
 Enter element of first matrix

1 2 0 0 1 1 2 0 1

Enter element of second matrix

1 1 2 2 1 1 1. 2 1

Product of matrices:

5 3 . 4

3 3 2

3 4 5

Ques Write a program to multiply two matrices of dimension 3x3 and store the result in another matrix (write comments also at appropriate places) (2018)

Soln

```
#include <stdio.h>
int main()
{
    a[3][3], b[3][3], c[3][3], i, j
    printf("Enter elements of first matrix\n");
    for( i=0 ; i<3 ; i++ ) // Take first matrix from user
    {
        for(j=0 ; j<3 ; j++)
            scanf("%d", &a[i][j])
    }
    printf("Enter elements of second matrix\n");
    for( i=0 ; i<3 ; i++ ) // Take second matrix from user
    {
        for(j=0 ; j<3 ; j++)
    }
}
```

```

scanf ("%d", &b[i][j]); /  

3  

for (i=0; i<3; i++) /* calculating product of matrix */  

{  

    for (j=0; j<3; j++)  

    {  

        c[i][j] = 0  

        for (k=0; k<3; k++)  

        {  

            c[i][j] = c[i][j] + a[i][k] * b[k][j];  

        }  

    }  

    printf ("Output matrix:\n"); // printing output matrix  

    for (i=0; i<3; i++)  

    {  

        for (j=0; j<3; j++)  

        {  

            printf ("%d", c[i][j]);  

        }  

        printf ("\n");
    }
}

```

Output Enter element of first matrix

1 2 0 0 1 1 2 0 1

Enter element of second matrix

1 1 2 2 1 1 1 2 1

Output matrix :

5	3	4
3	3	2
3	4	5

Qn9. write a program in C for matrix addition. (2016-17)

Sol #include <stdio.h>

```
int main()
```

```
{
```

```
    int a[10][10], b[10][10], sum[10][10], i, j, m, n
```

```
    printf("Enter rows and column of matrix");
```

```
    scanf("%d%d", &m, &n);
```

```
    printf("In enter first matrix");
```

```
    for(i=0; i<m; i++)
```

```
{
```

```
        for(j=0; j<n; j++)
```

```
{
```

```
            scanf("%d", &a[i][j]);
```

```
}
```

```
}
```

```
    printf("In enter second matrix");
```

```
    for(i=0; i<m; i++)
```

```
{
```

```
        for(j=0; j<n; j++)
```

```
{
```

```
            scanf("%d", &b[i][j]);
```

```
}
```

```
}
```

```
    printf("Output matrix: \n");
```

```
    for(i=0; i<m; i++)
```

```
{
```

```
        for(j=0; j<n; j++)
```

```
{
```

```
            sum[i][j] = a[i][j] + b[i][j];
```

```
}
```

```
            printf("%d", sum[i][j]);
```

```
}
```

```
            printf("\n");
```

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Output: Enter rows & columns of matrix 2 2

Enter first matrix 2 2 2 2

Enter second matrix 3 3 3 3

Output matrix :

5 5

5 5

Quill write a program in C to find the largest number of a 4 \* 4 matrix. (2017-18, 2016-17)

```
#include <stdio.h>
int main()
{
    int a[4][4], largest, i, j
    printf ("Enter elements of 4*4 matrix");
    for (i=0 ; i<4; i++)
    {
        for (j=0 ; j<4; j++)
        {
            scanf ("%d", &a[i][j]);
        }
    }
    largest = a[0][0];
    for (i=0; i<4; i++)
    {
        for (j=0; j<4; j++)
        {
            if (a[i][j] > largest)
                largest = a[i][j];
        }
    }
    printf ("Largest element is %d", largest);
    return 0;
}
```

Output:- Enter element of 4x4 matrix 1 2 3 4 5 1 2 3 4 5  
 11 2 6  
 largest element is 6.

Ques- Write a program to add two matrices of dimension 3x3 and store the result in another matrix. (2017-18)

Solt #include <stdio.h>

int main()

{

int a[3][3], b[3][3], sum[3][3]; i<sup>o</sup>, j ;

printf ("Enter elements of first matrix \n");

for (i=0; i<3; i++)

{

for (j=0; j<3; j++)

{

scanf ("%d", &a[i][j])

}

printf ("Enter elements of second matrix \n");

for (i=0; i<3; i++)

{

for (j=0; j<3; j++)

{

scanf ("%d", &b[i][j]),

3

printf ("Output matrix is : \n");

for (i=0; i<3; i++)

{

for (j=0; j<3; j++)

{

sum[i][j] = a[i][j] + b[i][j];

printf ("%d \n", sum[i][j]);

3

3

Input:- Enter elements of first matrix

1 1 1 2 2 2 3 3 3

Enter elements of second matrix

1 1 1 1 1 1 1 1

Output matrix is :

2 2 2

3 3 3

4 4 4

What are advantages of using array? (20-21)

Ex:- write a program for matrix multiplication of two matrix elements. (refer Ques 7 for solution)

1) In an array, accessing an element is very easy by using the index number.

2) The search process can be applied on any array very easily.

3) Matrix can be represented as 2D array.

4) If a user wishes to store multiple value of similar data type then array can be use.

Explain passing array to functions in detail?

Passing array to function :- There are various problems in which we wish to pass more than one variable to a function - ex:- In a function which sorts the 10

Elements in attending order. To such function we can pass an array of 10 elements instead of passing 10 variable as actual parameter. There are different ways to pass the array as argument to the function.

- ① Passing single element of array to function: We can pass single element of an array as actual argument to the function.

Ex :-

```
#include <stdio.h>
void display (int age)
{
    printf ("%d", age);
}
int main()
{
    int ageArray [] = { 2, 3, 4 };
    display (age Array [2]);
    return 0;
}
```

Output:- 4

- ② Passing an entire array to function: An entire array can be passed to function as argument.

Ex:-

```
#include <stdio.h>
float average (float age []);
int main()
{
    float avg, age [] = { 23.4, 55, 22.6, 3, 40.5, 18.3 };
    avg = average (age);
```

```
printf("Average age=%f", avg);
```

```
return 0;
```

```
3
```

```
float average( float age[])
```

```
{
```

```
int i;
```

```
float avg, sum = 0.0;
```

```
for (i=0; i<6; i++)
```

```
{
```

```
sum += age[i];
```

```
3
```

```
avg = (sum/6);
```

```
return avg;
```

```
3
```

Output:-

Average age = 27.080000

③ Passing multidimensional array to function :- we can also pass multidimensional array to function.

Ex:- #include <stdio.h>

```
void displayNumbers( int num[2][2]);
```

```
(int main()
```

```
{
```

```
int num[2][2], i, j;
```

```
printf("Enter 4 numbers : \n");
```

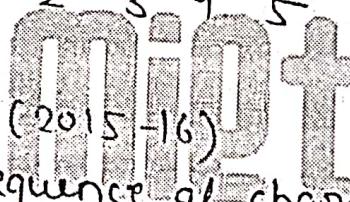
```
for (i=0; i<2; i++)
```

```
for (j=0; j<2; j++)
```

```
scanf("%d", &num[i][j]);
```

```
displayNumbers(num);  
return 0;  
}  
  
void displayNumbers( int num[2][2] )  
{ int i, j ;  
    printf ("Displaying :\n");  
    for( i=0 ; i<2 ; i++ )  
        for( j=0 ; j<2 ; j++ )  
            printf ("%d\t", num[i][j]);  
}
```

Output:- Enter 4 numbers : 2 3 4 5  
Displaying : 2 3 4 5



Q13 What is string ? (2015-16)

A13 A string is a sequence of character terminated with a null character "\0".

Ex:- char C[] = "Hello World";

When the compiler encounters a sequence of character enclosed in the double quotation marks, it appends a null character at the end by default.

Q14-Explain in brief the purpose of 'strcmp' function.  
A14 This strcmp() function is used to compare two strings. The strcmp() function returns 0 if both the strings are same. (2015-16)

Syntax:- int i = strcmp( first\_string , second\_string );

Ex:- char first [] = "Hello";  
char second [] = "Hello";  
int d = strcmp(first, second);  
 $\Rightarrow d = 0$

Ques- write a program to reverse a string by using pointer. (2017-18)

Ans

```
#include <stdio.h>
#include <conio.h>
void strrev();
void main()
{
    char name[100];
    int i;
    clrscr();
    printf("Enter a string\n");
    gets(name);
    strrev(name);
    printf("After reverse string is : \n");
    puts(name);
    getch();
}
```

3  
Void strrev(char \*s)

```
{ int i=0;
char *l, *t;
l = s;
while (*l != '\0')
```

```
{ i++;
l++;
```

3 l--;

```
i = '12';
while(i > 0)
{
    j = *i;
    *i = *j;
    *j = i;
    i++;
    j--;
    i--;
}
```

3  
3

Output:- Enter a string  
RAM

After reverse a string in  
MAR

V. imp Ques 16- Explain the significance of null character in string

Ans Any Null character is used to represent the end of a string of character.

Ex:- char s[] = "Test" can be written as  
char s[] = {'T', 'e', 's', 't', '\0'}

String library function:-

① strlen(s) :- It counts number of character present in string.

Ex:- #include <stdio.h>  
# include <conio.h>  
# include <string.h>  
void main()  
{  
 char s[10];

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```
int i;
clrscr();
printf("Enter string");
gets(s);
l = strlen(s);
printf("String length = %d", l);
getch();
```

3

Output:- Enter string RAM  
String length = 3

② strcpy:- It copies the content of string s1 into string s2.

Ex:- #include <stdio.h>  
#include <conio.h>  
#include <string.h>  
void main()  
{  
 char s1[10], s2[10];  
 clrscr();  
 printf("Enter string");  
 gets(s1);  
 strcpy(s2, s1);  
 printf("\n String copied is. \n");  
 puts(s2);  
 getch();

miot

3

③ strcat(s2, s1):- It joins the content of string s1 with string s2.

```

Ex:- #include <stdio.h>
      #include <conio.h>
      #include <string.h>
      void main()
      {
          char s1[10], s2[10];
          clrscr();
          printf("Enter string 1 \n");
          gets(s1);
          printf("In. Enter string 2 \n");
          gets(s2);
          strcat(s2, s1);
          printf("In string after join \n");
          puts(s2);
          getch();
      }
  
```

3

Output:- Enter string 1  
 RAM  
 Enter string 2  
 RAJ  
 RAJRAM

⑨ strrev(s) :- This function is used to reverse the string.

```

Ex:- #include <stdio.h>
      #include <conio.h>
      #include <string.h>
      void main()
      {
          char s[10];
          clrscr();
  
```

```
printf ("Enter string");  
gets(s);  
strrev(s);  
printf ("String reverse is \n");  
puts(s);  
getch();  
3
```

Output:- Enter string  
ABC  
String reverse is  
CBA

Ques

Differentiate between structure and union. (2015-16, 2018-19  
2019-20, 2020-21)

Ans

Structure



Union



- |   |   |
|---|---|
| <p>① Keyword struct is used to define a structure.</p> <p>② Every member within structure is assigned a unique memory location.</p> <p>③ Changing the value of one data member will not affect other data member in structure.</p> <p>④ The total size of the structure is the sum of the size of every data member.</p> <p>⑤ We can retrieve any member at a time.</p> | <p>① Keyword union is used to define a union.</p> <p>② Memory location is shared by all data members.</p> <p>③ Changing the value of one data member will change the value of other data member of union.</p> <p>④ The total size of the union is the size of the largest data member.</p> <p>⑤ You can access one member at a time in the union.</p> |
|---|---|

⑥ Syntax:

```
struct student {
    char name[20];
    int age;
    char address[50];
} std;
```

⑥ Syntax:

```
union student {
    char name[20];
    int age;
    char address[50];
} std;
```

Ques 18 Describe structure. Differentiate between structure and array. Define structure data type called time\_struct containing three member's integer hour, integer minute and integer second.

or

Write a program in c that would assign value to the individual members and display the time in the following form: 16:40:52

Ans A structure is a user defined data type which contains number of similar and dissimilar data types group together.

Syntax

```
struct [structure tag]
{
```

member definition;  
member definition;

=  
=

member definition;

3

[One or more structure variable]

Example

```
struct books
{
```

```
char title[50];
char author[50];
char subject[50];
int book_id;
```

3 book;

B. Tech I Year [Subject Name: Programming for Prob. Sol.]

Ques: Explain structure with suitable example (2015-16)  
Ques: Difference between structure & array (2015-16, 2016-17)

<u>Ans</u>	<u>Array</u>	<u>Structure</u>
	① Array is the collection of same data type elements.	① Structure is the collection of variable of different data type.
	② Syntax:- type array-Name [size]	② Syntax: struct struct-name { type element 1; type element 2; ! } 3 structure-variable;
	③ Array elements are stored in contiguous memory location.	③ Structure element may not be stored in a contiguous memory location.
	④ Array elements are accessed by their index number.	④ Structure elements are accessed by their names.
	⑤ Array declaration and elements accessing operator is "[]" (square) bracket.	⑤ Structure element accessing operator is ". " (Dot operator)
	⑥ Every element in array is of same size.	⑥ Every element in a structure is of different data type.
	⑦ No keyword is to declare array.	⑦ Struct keyword is used

```
#include <stdio.h>
struct time_struct
{
    int hour;
    int minute;
    int second;
};

int main()
{
    printf("In enter hour:");
    scanf("%d", &t.hour);
    printf("In enter minute:");
    scanf("%d", &t.minute);
    printf("In enter second:");
    scanf("%d", &t.second);
    printf("%d:%d:%d", t.hour, t.minute, t.second);
    return 0;
}
```

Output:- Enter hour 16  
Enter minute 40  
Enter second 51  
16:40:51

Ques 20:- write a C program to store the employee details using structure. (2015-16)

```
#include <stdio.h>
struct EMPL
{
    int employee_no[];
    char employee_name[20];
    char employee_edu[10];
} emp[50];
int main()
{
    int i;
    printf("In Enter details of 50 employees");
    for(i=0; i<50; i++)
    {
        scanf("%d %s %s", &emp[i].employee_no, emp[i].employee_name, emp[i].employee_edu);
    }
    for(i=0; i<50; i++)
    {
        printf("Employee %d details are: \n", i+1);
        printf("EMP No = %d, EMP Name = %s, EMP Education=%s",
               emp[i].employee_no, emp[i].employee_name, emp[i].employee_edu);
    }
    return 0;
}
```

Output:- Enter details of 50 employees

20 Ram B.Tech

30 Raj MCA

!

40 Suresh B.Tech

Employee 1 details are:

20 Ram B.Tech

Employee 2 details are:

30 Raj MCA

!

Employee 50 details are:

40 Suresh B.Tech

Ques 21- Describe the relation between structure & pointer.

Ans Pointer variable can be declared along with structure. (2015-16)

A pointer variable of structure can be created as follows:

struct name {

    member1;

    member2;

    !

    !

    !

};  
struct name \* ptr;

Here, the pointer variable of type struct name is created.

Example to access structure member using pointer -

```
#include <stdio.h>
struct name
{
    int a;
    float b;
} p;
int main()
{
    struct name *ptr, b;
    ptr = &p;
    printf("Enter integer:");
    scanf("%d", &(ptr).a);
    printf("Enter number:");
    scanf("%f", &(ptr).b);
    printf("Displaying:");
    printf("%d %f", (ptr).a, (ptr).b);
    return 0;
}
```

3

In this example, the pointer variable of type struct name is referenced to the address of p. Then, only the structure member can also be accessed using  $\rightarrow$  operator  $(\&ptr).a$  is same as  $ptr \rightarrow a$ .

Ques: Write a program in C to create a database of fifty students to store personal details such as roll No, name & marks, print all the details of students whose name is entered by the user. (2016-17, 2017-18)

Soln.

```
#include <iostream.h>
#include <stdio.h>
#include <conio.h>
struct student
{
    int roll_no;
    int marks;
    char name[20];
    char s[50];
};

void main()
{
    int i;
    char c = 'y';
    char sname[20];
    clrscr();
    for(i=0; i<50; i++)
    {
        printf("Enter roll no, name & marks \n");
        scanf("%d %s %d", &s[i].roll_no, &s[i].name, &s[i].marks);
        if(strcmp(s[i].name, sname) == 0)
    }
}
```

while (c == 'y')

```

{
    printf("Enter name of students whose record
           you want to display : ");
    scanf("%s", &sname);
    for(i=0; i<50; i++)
    {
        if(strcmp(s[i].name, sname) == 0)
    }
}
```

```
{  
    printf( " \n %d %t %s %t %d ", s[i].roll_no,  
           s[i].name, s[i].marks);  
}
```

```
3  
printf (" Enter Y for continual ");  
fflush ( stdin );  
scanf (" %c ", &c );  
3  
getch();  
3
```

Output:- Enter roll no, name & marks

```
12 RAM 50  
15 shyam 70  
!  
20 Sita 81
```

Input

Enter name of student whose record you want to  
display

RAM

```
12 RAM 50
```

Ques Write a C program to store the employee information  
using structure and search a particular employee  
using employee number.

Take the structure EMP1 and its member EmployeeNo.  
EmployeeName, EmployeeEdu.

Soln  
#include <stdio.h>  
#include <string.h>  
#include <conio.h>

```
struct EMPL {  
    int employee No  
    char employee Name[20];  
    char employee Edu[10];  
};  
  
void main()  
{  
    int i, eno; char ch='y';  
    for( i=0; i<50; i++ )  
    {  
        printf("Enter employee no , employee name and  
               employee education \n");  
        printf("Enter employee No");  
        scanf("%d", &emp[i].employee No);  
        printf("In Enter employee Name");  
        scanf("%s", &emp[i].employee Name);  
        printf("In Enter employee Education");  
        scanf("%s", emp[i].employee Edu);  
    }  
    while( ch=='y')  
    {  
        printf("In Enter employee no you want to search");  
        scanf("%d", &eno);  
        for(i=0; i<50; i++)  
        {  
            if( eno==emp[i].employee No)  
            {  
                printf("\n%.d\t%.s", emp[i].employee No,  
                      emp[i].employee Name, emp[i].employee Edu);  
            }  
        }  
    }  
}
```

```
3  
printf("Enter Y for continue");  
fflush(stdin);  
scanf(" %c ", &ch);  
3  
getch();  
3
```

Output:- Enter employee no, employee name and employee education.

Enter employee No 12

Enter employee Name sweth

Enter employee Education B.Tech

Enter employee no, employee name and employee education

Enter employee No 14

Enter employee Name Ramesh

Enter employee Education MCA

Enter employee no you want to search

12

12 sweth B.Tech

Enter Y for continue

n

Ques

Write a program that compares two given dates.

To store date we structure say date that contains three members namely date, month & year. If dates are equal then display message as "Equal" otherwise "Unequal".

```

Sdt #include <stdio.h>
struct Date
{
    int date
    int month
    int year
}
d1, d2;
int main()
{
    printf("Enter first date (dd/mm/yyyy):");
    scanf("%d %d %d", &d1.date, &d1.month,
          d1.year);
    printf("\n");
    printf("Enter second date (dd/mm/yyyy):");
    scanf("%d %d %d", &d2.day, &d2.month, &
          d2.year);
    if ((d1.day == d2.day) && (d1.month == d2.month) &&
        (d1.year == d2.year))
        printf("Equal");
    else
        printf("Unequal");
    return 0;
}

```

Output:- Enter first date (dd/mm/yyyy):  
 22 11 1996  
 Enter second date (dd/mm/yyyy):  
 22 11 1996  
 Equal.

Ques 25 Explain structures in C programming. Write a program in C using structure to enter and print the record of 10 books available in your library. Following fields may be included in the record : book-title, book-price and number of pages.

Ans #include <stdio.h>  
struct book {

```
    char book-title[50],  
        float book-price;  
    int number-of-pages;  
} b[10];  
  
int main()  
{  
    int i  
    for(i=0; i<10; i++)  
    {  
        printf("Enter title, price & no of pages of book  
              %d", i+1);  
        scanf("%s %.f %d", b[i].book-title, &b[i].book-  
              price, &b[i].number-of-pages);  
        printf("\n");  
    }  
    for(i=0; i<10; i++)  
    {  
        printf("In Book %d details: %s %.f %d",  
              b[i].book-title, b[i].book-price, b[i].  
              number-of-pages);  
    }  
}
```

return 0;

3

Output:- Enter title, price & no of pages of book 1

Book 1 100.0 100

Enter title, price & no. of pages of book 10

Book 10 900.0 120

Book 1 details : Book1 100.0 100

Book 10 details : Book10 900.0 120

Ques Create a suitable structure in C language for keeping the records of the employees of an organization about their code, Name, designation, salary, department, city of posting. Also write a program in C to enter the records of 100 employees and display the name of those who earn more than 20,000. (2019-20)

Soln #include <stdio.h>

struct emp

```
{ int code ;  
    char Name[20] ;  
    char Designation[10] ;  
    float Salary ;  
    char Department[10] ;  
    char city_of_posting[20] ;  
    struct emp e[100] ; }
```

```
int main()
{
    printf("Enter details of 100 employees:");
    for(i=0; i<100; i++)
    {
        scanf("%d %s %s %f %s %s", &e[i].code,
              e[i].Name, e[i].Designation, &e[i].Salary,
              e[i].Department, e[i].city_of_posting);
    }
    printf("Name of employees whose salary is above 20k");
    for(i=0; i<100; i++)
    {
        if(e[i].Salary > 20000)
            printf("\n%d", e[i].name);
    }
    return 0;
}
```

Output- Enter detail of 100 employees:

1 RAM AP 10000 MGMT DELHI  
2 RAJ AP 21000 FINANCE MUMBAI  
;

Name of employees whose salary is above 20k  
RAJ

Ques Write short notes on  
○ Union

Ans ○ Enumerated data types.

(2016-17, 2018-19).

Any Union:- A union is a special data type available in C that enables us to store different data types in the same memory location.

We can define a union with many members, but only one member can contain a value at a time. Union provide an efficient way of using the same memory location for multiple purpose.

Syntax:-

```
union Union-name
{
    Union-member1
    Union-member2
}
union-variable
```

Example:-

```
union Data {
    int i;
    float f;
    char str[20];
}
data;
```

Enumerated data type: A enumeration is a user defined data type consists of integral constants and each integer constant is given a name. Keyword enum is used to define enumerated data type.

Syntax:- enum type-name { value1, value2, ---valueN};

Example:-

```
enum week{sun,mon,tue,wed,Thu,fri,sat};
int main()
{
```

```
    enum week today;
```

```
    today=wed;
```

```
    printf("%d day", today+1);
    return 0;
```

Output:- 4 day

Ques 28 Explain linear search and binary search techniques for searching an item in a given array. Also write the complexity for each searching algorithm.

Ans ① Linear search: In this method each element of the list checked in a sequential manner until desired element is found. (2018-19)

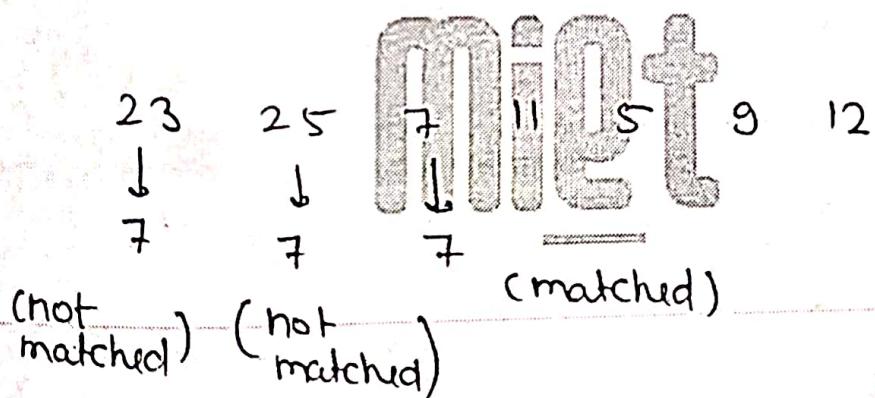
Example:- Suppose a list is given as and we want to

23 25 7 11 5 9 2

Search element 7 in the list.

First we compare 23 with 7 then 25 then with 7, here match has found therefore this process return either message element found or element found at location

3.



(return location where element found)

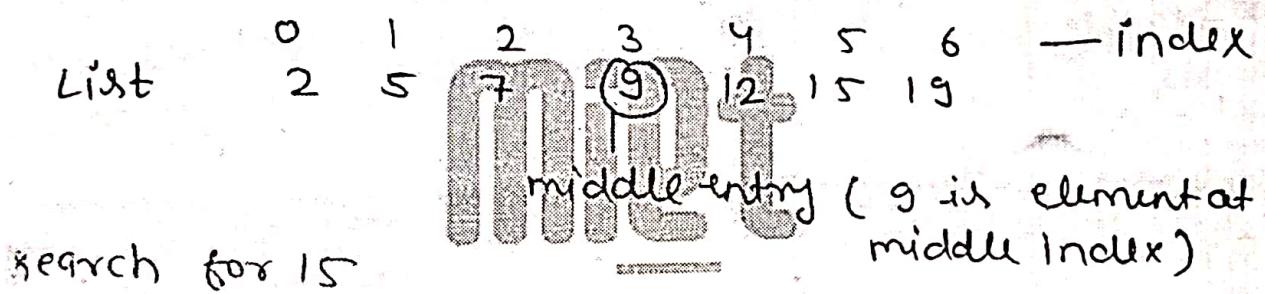
Complexity:-  $O(n)$ , where n is the number of elements in which we are searching for a particular element.

② Binary search: The basic requirement for the binary search algorithm to be applied is that input array must be arranged in either ascending or descending order.

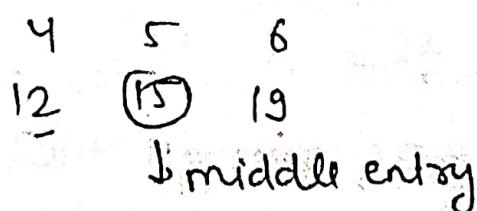
In this technique the approximate middle entry of the array is located, and its key is examined. If key is greater than the value we want to search then in next iteration we discard the second half of the array & then we apply same procedure on first half.

If key is less than the value we want to search then in next iteration we discard 1<sup>st</sup> half of the array & then we apply same procedure on second half.

If key is equal to value we want to search for then return the index/location where found element.



$\therefore$  discard array portion from index 0 to 3 & apply same procedure to 2nd half of array.



Here element present at middle index=15 and also we want to search for element 15,  $\therefore$  return index of this element + 1 (6 in this case) as location of element we want to search.

Complexity :-  $O(\log n)$

Ques: Differentiate between linear search and binary search.  
Ans:

Basics	Linear search	Binary search
Time complexity	$O(n)$	$O(\log_2 n)$
Prerequisite for an array	Not required	Array must be in sorted order.
Best case time	first element $O(1)$	center element $O(1)$
Worst case for n number of elements	$n$ comparisons are required	can conclude after only $\log_2 n$ comparison.
Can be implemented on	Array & linked list	can't be directly implemented on linked list
Ancest operation	New element can be easily inserted at the end of the list	Processing is required to insert element at its proper place in sorted list
Usefulness	Easy to use	Tricky algorithm
Lines of code	Less	More

Ques 30 - WAP for Linear Search.

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[30], i, e, n;
    printf("Enter no. of elements");
    scanf("%d", &n);
    printf("Enter array elements\n");
    for (i=0; i<n; i++)
        scanf("%d", &a[i]);
    printf("Enter element to be searched\n");
    scanf("%d", &e);
    for (i=0; i<n; i++)
    {
        if (a[i] == e)
            break;
    }
    if (i == n)
        printf("%d is not present", e);
    else
        printf("%d is present at loc=%d", e, i+1);
}
```

Ques:-3! W A P for Binary Search.

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[30], n, i, l, h, mid, e;
    printf ("enter no. of elements");
    scanf ("%d", &n);
    printf ("enter array elements in sorted order");
    for (i=0; i<n; i++)
        scanf ("%d", &a[i]);
    printf ("enter search element");
    scanf ("%d", &e);
    l = 0;
    h = n-1;
    while (l <= h)
    {
        mid = (l+h)/2;
        if (e == a[mid])
        {
            printf ("%d is present at %d", e, mid+1);
            break;
        }
    }
}
```

3

```
else if ( e > a[mid] )  
    l = mid + 1;  
else  
    h = mid - 1;  
}  
if ( l > h )  
    printf (" %d is not present ", e);  
getch();  
}
```

Output:-

M i l t

enter no. of elements

5

enter array element

2

3

6.

1.0

15

enter search element

3

3. is present at 2

Ques what do you mean by sorting? write program to sort the given  $n$  positive integers. Also give the flowchart for the same. (2015-16, 2016-17 (Isem))  
'or'

Write a program in C for sorting  $N$  positive integers in ascending order (2016-17 (IIsem))

'or'

write a C program to sort set of integers in ascending order by using bubble sort technique. (2017-18)

'or'

Write the importance of sorting in problem solving  
write a program in C using bubble sort technique to sort 10 numbers entered by the user. (2018-19)

Ans what do you mean by sorting? write a program in C to sort ' $n$ ' positive integers using bubble sort. Also draw the flowchart for the same. (2019-20)

OR

Define sorting algorithm with example. (2020-21)

Ans Sorting:- It is the process of arranging data in some given sequence or order (in increasing) or decreasing order.

Ex: Suppose we have an array of 10 elements,

10, 3, 6, 12, 4, 17, 5, 9, 25, 24

After sorting in ascending order values will be

3 4 5 6 9 10 12 17 24 25

Sorting algorithm:-

- ① Bubble sort
- ② Selection sort
- ③ Insertion sort

imp.

Program:-

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int i, j, t, a[25], n;
    printf("How many elements");
    scanf("%d", &n);
    printf("Enter %d elements:", n);
    for(i=0; i<n; i++)
    {
        scanf("%d", &a[i]);
    }
    for(i=0; i<n-1; i++)
    {
        for(j=0; j<n-1-i; j++)
        {
            if(a[j] > a[j+1])
            {
                t=a[j];
                a[j]=a[j+1];
                a[j+1]=t;
            }
        }
    }
}

```

```

printf("An sorted array is \n");
for (i=0 ; i<n ; i++)
{
    printf("%d \t", a[i]);
}
getch();

```

Output:- How many elements to  
enter 10 elements

10 5 6 9 12 1 7 13 19 16  
Sorted array

1 5 6 7 9 10 12 13 16 19

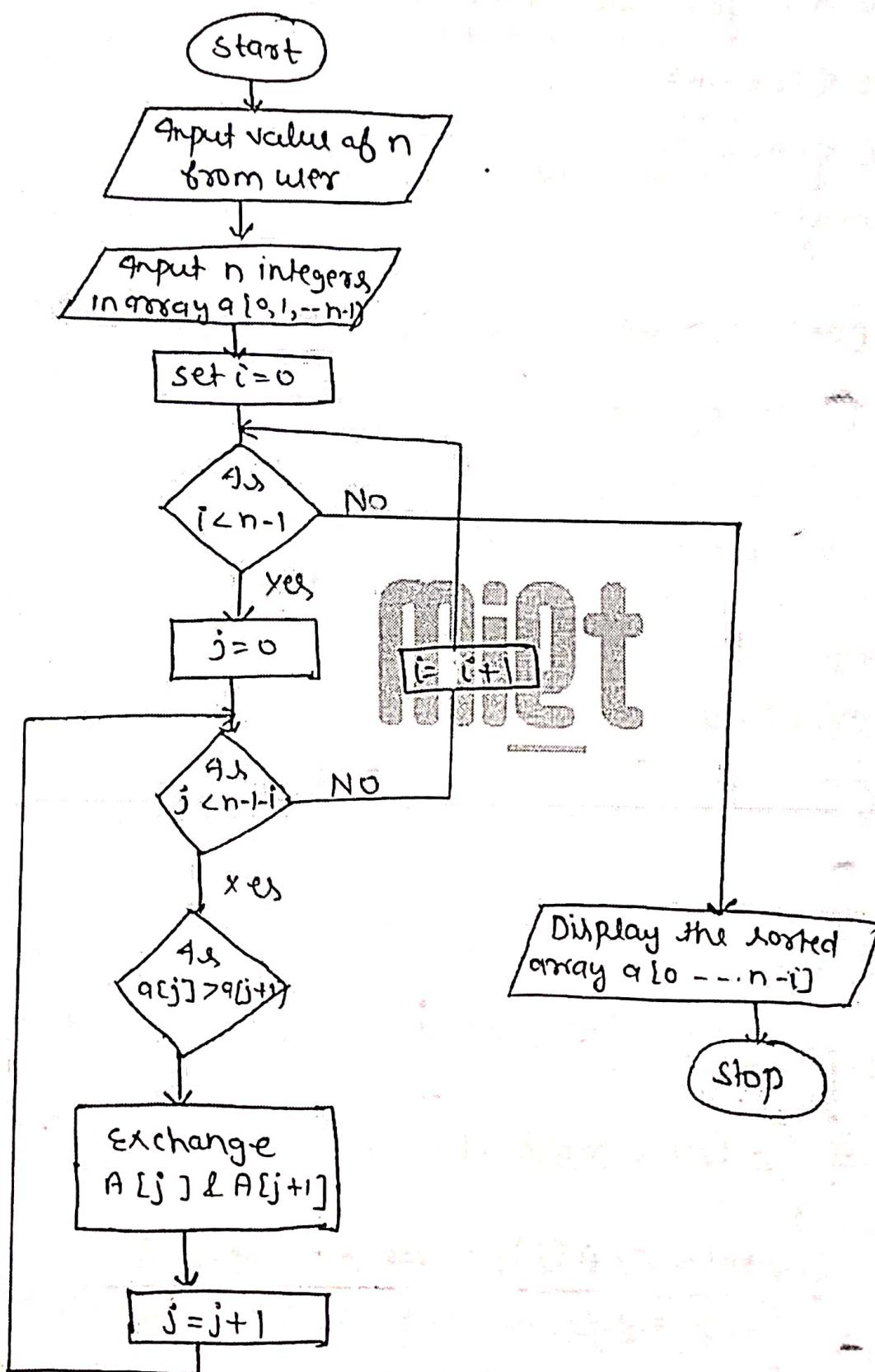
Example :- If n=4 & numbers are 4 3 2 1

i=0	4 3 2 1	Compare a[0], a[1]
	3 4 2 1	Compare a[1], a[2]
	3 2 4 1	Compare a[2], a[3]
	3 2 1 4	3 compare (n-1-i)
i=1	3 2 1 4	Compare a[0], a[1]
	2 3 1 4	Compare a[1], a[2]
	2 1 3 4	2 compare (n-1-i)
	2 1 3 4	Compare a[0], a[1]
	1 2 3 4	1 compare (n-1-i)

For each pass we need  $n-1-i$  comparison

Complexity! -  $O(n^2)$

Flowchart Bubble sort :-



Ques:-33 W A P for selection Sort..

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[25], i, min, n, p, t, j;
    printf (" No: of elements");
    scanf ("%d", &n);
    for (i=0; i<n; i++)
    {
        printf (" enter values");
        scanf ("%d", &a[i]);
    }
    for (i=0; i<n-1; i++)
    {
        min = a[i];
        p = i;
        for (j=i+1; j<n; j++)
        {
            if (a[j]<min)
            {
                min = a[j];
                p = j;
            }
        }
    }
```

$t = a[i];$

$a[i] = a[p];$

$a[p] = t;$

3

`printf (" Sorted array ");`

`for (i=0; i <n; i++)`

`printf ("%d", a[i]);`

`getch();`

3

### Output

No. of elements

5

Enter value

5 2 7 3 1

Sorted array

1 2 3 5 7

Ques. Explain selection sort technique for sorting problem.

Write an algorithm for selection sort - sort the following number using selection sort technique. (2018-19)

'or'

Explain selection sort technique with example. (2020-21)

Ans Selection sort is a simple sorting algorithm. In this the list is divided into two parts, the sorted part at the left and unsorted part at the right side.

Initially sorted part is empty & unsorted part is entire list. The smallest element is selected from the unsorted array & swapped with the leftmost element, and that element becomes a part of sorted list.

The process continues moving unsorted array boundary by one element by one element to the right.

Time complexity =  $O(n^2)$

Algorithm: ① Start

② Repeat step 3, 4, 5, 6 for  $i = 0$  to  $n - 2$

③ Set  $min = a[i]$  and  $loc = i$

④ Repeat step 5 for  $j = i + 1$  to  $n - 1$

⑤ If  $min > a[j]$  then  $min = a[j]$  and  $loc = j$

⑥ Interchange  $a[i]$  and  $a[loc]$  by

$temp = a[i]$ ,  $a[i] = a[loc]$  and  $a[loc] = temp$

⑦ Stop.

Q Sort the following number using selection sort.

(26) 54 93 (17) 77 31 44 55 20

smallest is 17 so exchange with 26

17 (54) 93 26 77 31 44 55 (20)

Now smallest element is 20 so exchange with 54

17 20 (93) (26) 77 31 44 55 54

Now smallest element is 26 so exchange with 93

17 20 26 (93) 77 (31) 44 55 54

Now smallest element is 31 so exchange with 93.

17 20 26 31 (77) 93 (44) 55 54

Now smallest element is 44 so exchange with 44

17 20 26 31 44 (93) 77 55 (54)

Now smallest element is 54 so exchange with 93

17 20 26 31 44 54 (77) (55) 93

Now smallest element is 55 so exchange 55 & 77

17 20 26 31 44 54 (77) 93

Now 77 is smallest and its already in proper place

17 20 26 31 44 54 55 77 93

Ques 35: what is insertion sort? Explain it with algorithm & example?

Ans This algorithm places an unsorted element at its suitable place in each iteration. Insertion sort works similarly as we sort cards in our hand in a card game. We assume that first card is sorted then

we select unsorted card. If unsorted card is greater than the card in hand, it is placed on the right. otherwise to the left. In the same way, other unsorted cards are taken and put in their right place. Similar approach is used by insertion sort.

Algorithm:-

- (1) Start
- (2) Iterate from arr[1] to arr[n] over the array.
- (3) Compare the current element (key) to its predecessor.
- (4) If the key element is smaller than its predecessor, compare it to the element before.

Move the greater elements one position up to make space for the swapped element.

Example:- 12 11 13 5 6

$i = 1$  to 4

Key = 11 and  $key < 12$  move 12 & insert 11 before 12

11 12 13 5 6

Now key is 13 and  $13 > 12$ . so no need to move element

11 12 13 5 6

Now key is 5 and  $5 < 13$  &  $5 < 12$  &  $5 < 11$  so move 13, 12, 11 one place right and place 5 at first place (index 0)

5 11 12 13 6

Now key is 6 and  $13 > 6$  &  $12 > 6$  &  $11 > 6$

Therefore move 13, 12 & 11 one place toward right and place 6 at position 2 in array (index 1)

~~input~~  
Program (insertion sort)

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int i, j, a[25], n, key
    printf("how many elements:");
    scanf("%d", &n);
    printf("enter values:");
    for(i=0; i<n; i++)
    {
        scanf("%d", &a[i]);
    }
    for(i=1; i<n; i++)
    {
        key = a[i];
        for(j=i-1; j>=0; j--)
        {
            if(a[j]>key)
            {
                a[j+1] = a[j];
            }
            else
            {
                break;
            }
        }
        a[j+1] = key;
    }
    printf("\n sorted array is \n");
    for(i=0; i<n; i++)
    {
        printf("%d", a[i]);
    }
}
```

getch();

3

Output:- how many elements:

6

Enter values:

5 6 3 2 1 4

sorted array is

1 2 3 4 5 6

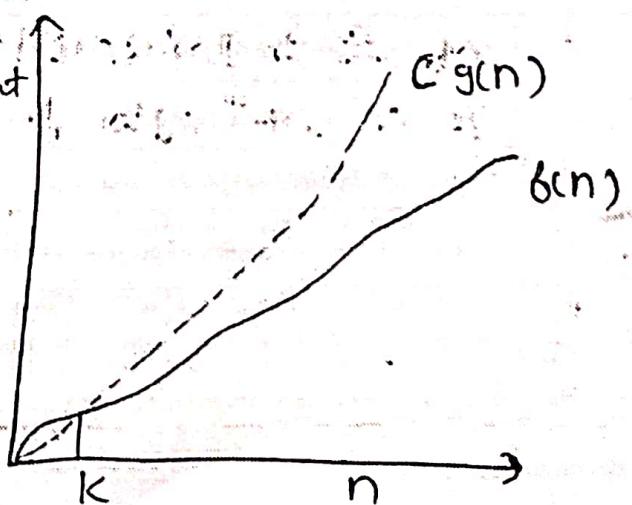
inp:

Ques: What do you mean by order of complexity? Explain various notation to represent order of complexity with diagram. (2013-19)

Ans: Order of complexity of an algorithm is a way of predicting / saying how execution time of a program and space/ memory occupied by its change with in change in input size.

Asymptotic notations are mathematical tools to represent time complexity of algorithm for asymptotic analysis.

① Big Oh Notation:



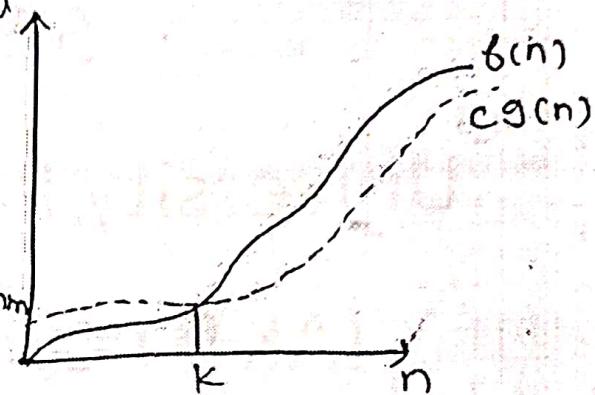
Big Oh( $O$ ) notation is formal way to express the upper bound of an algorithm running time. It measures the worst case time complexity or the longest amount of time an algorithm can possibly take to complete.

Ex:-  $O(g(n)) = \Sigma f(n)$

These exist positive constants  $c$  and  $k$  such that

$$0 <= f(n) <= c * g(n) \text{ for all } n \geq k$$

- ② Omega Notation:- The omega notation is the formal way to express lower bound of an algorithm's running time. It measures the best case time complexity or the best amount of time an algorithm can possibly take to complete



Ex:- for a function  $f(n)$

$\Omega(g(n)) = \{ f(n) : \text{there exists positive constant } c \text{ and } k \text{ such that}$

$$0 <= c * g(n) <= f(n) \text{ for all } n \geq k\}$$

- ③ Theta Notation,  $\Theta$ :- This is a formal way to express both the lower & upper bound of an algorithm's running time

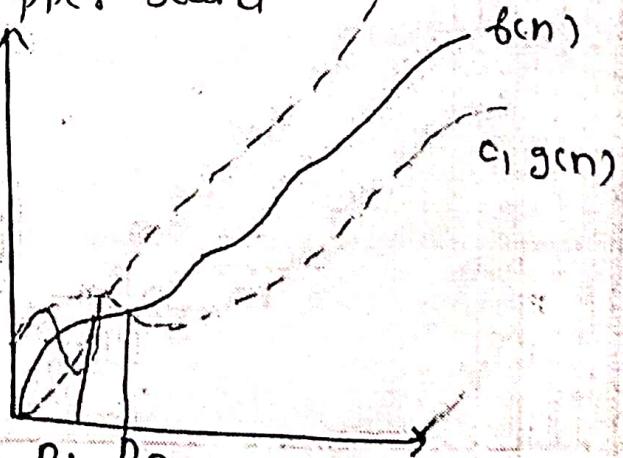
It is represented as follows:

Ex:-  $\Theta(g(n)) = \{ f(n)$ .

• There exists positive constant  $c_1, c_2, k$  such that

$$0 <= c_1 * g(n) <= f(n) <= c_2 * g(n)$$

for all  $n \geq k$



B. Tech I Year [Subject Name: Prog. for Problem Solving]

**5 Year's**  
**University Paper Questions**  
**(AKTU Question Bank)**



**B. Tech I Year [Subject Name: Programming for Prob. Sol.]**

5 Years AKTU University Examination Questions		Unit-4	
S. No	Questions	Session	Lecture No
1	What is an array? Give an example.	16-17 (Even)	23-33
2	What are subscripts? How they are specified?	17-18 (Odd)	23-33
3	What is array? In which situation array is advantageous over linked list?	18-19 (Odd)	23-33
4	Write an algorithm to find second largest element in an array.	19-20 (Odd)	23-33
5	Write a program to find odd and even number from the array elements and its count.	20-21 (Odd)	23-33
6	Write a C program to check whether given square matrix is symmetric or not.	15-16 (Odd)	23-33
7	Write a C program to multiply two matrices. Take the size of elements of matrices from the keyboard.	15-16 (Odd)	23-33
8	Write a program to multiply the 2 matrices of size M*N	15-16 (Even)	23-33
9	Write a program in C for matrix addition.	16-17 (Odd)	23-33
10	Write a program to multiply two matrices of dimension 3*3 and store the result in another matrix	16-17 (Odd)	23-33
11	Write a C program to multiply two matrices and display the resultant matrix.	16-17 (Even)	23-33
12	Write a program in C to find the largest number of a 4*4 matrix.	17-18 (Odd)	23-33
13	Write a program to add two matrices of dimension 3*3 and store the result in another matrix	17-18 (Odd)	23-33
14	Write a program to multiply two matrices(read size and number of elements of matrices from the keyboard)	17-18 (Even)	23-33
15	Write a program in C to input two 3*3 matrix from the user and print multiplication as the result in matrix form.(Write comments also at appropriate places in the program)	18-19 (Even)	23-33
16	What are advantages of using array? Write a program for matrix multiplication of two matrix elements.	20-21 (Odd)	23-33
17	What is a String?	15-16 (Odd)	23-33
18	Explain in brief the purpose of 'strcmp' function.	15-16 (Odd)	23-33
19	Write a program in C to reverse a string by using pointer	17-18 (Odd)	23-33
20	Explain the significance of null character in string.	18-19 (Odd)	23-33
21	Differentiate between structure and Union.	15-16 (Odd)	23-33
22	Describe structure. Differentiate between structure and array. Define structure data type called time_structure containing three members's integer hour,integer minute and integer second.Write a program in C that would assign values to the individual members and display the time in the following form: 16:40:52	15-16 (Odd)	23-33
23	Explain struct with suitable example.	15-16 (Odd)	23-33

## B. Tech I Year [Subject Name: Programming for Prob. Sol.]

24	Differentiate between structure and union in 'C'. Write a 'C' program to store the employee details using structure.	15-16 (Odd)	23-33
25	Explain with example ,the syntax and usage of the following in C programs i)Array and Structure	15-16(Odd) 15-16 (Even)	23-33
26	Describe the relation between structures and pointer.	2015 (Even)	23-33
27	What is the difference between array and structure? Write a program in C to find the largest number of a 4*4 matrix.	16-17 (Odd)	23-33
28	Define a structure? Write a program in C to create a data base of fifty students to store personal details such as roll no, name and marks .Print all the details of students whose name is entered by the user.	16-17 (Odd),17-18 (Odd)	23-33
29	Write a C program to store the employee information using structure and search a particular employee using employee number. Take the structure EMPL and its member employee No, employee Name , employee edu.	16-17 (Even)	23-33
30	Differentiate between structure and array. .	17-18 (Odd)	23-33
31	Define structure with syntax. Also write a program that compares two given dates. To store data use structure say date that contains three members namely date, month and year. If the dates are equal then display message as "Equal" otherwise "Unequal"	17-18 (Even)	23-33
32	What is the difference between structure and union?	18-19 (Odd)	23-33
33	Explain the importance of structure in C programming. Write a program in C using Structure to enter and print the record of 10 books available in your library. Following fields may be included in the record:book_title , book_price and number_of_pages.	18-19 (Even)	23-33
34	Create a suitable structure in C language for keeping the records of the employees of an organization about their code , Name , Designation , salary , Department , City of posting. Also Write a program in C to enter the records of 100 employees and displays the name of those who earn more than 20,000	19-20 (Odd)	23-33
35	Differentiate structure and union.	19-20 (Odd) ,20-21 (Odd)	23-33
36	Write short notes on Union and Enumerated data type.	16-17 (Odd)	23-33
37	Write short note on following 1.Enumerated Data Type 2.String	18-19 (Odd)	23-33
38	Explain the following: i)Enumerated Data Type ii)Union	18-19 (Even)	23-33
39	Explain and write a C program to search a number in given 10 numbers	16-17 (Even)	23-33
40	Explain linear search and binary search technique for searching and item in a given array .Also write the complexity for each sorting algorithm.	18-19 (Odd)	23-33
41.	Differentiate between linear search and binary search.	18-19 (Even)	23-33
42	What do you mean by sorting? Write program to sort the given n positive integers. Also give the flowchart for the same.	15-16 (Odd)	23-33

**B. Tech I Year [Subject Name: Programming for Prob. Sol.]**

		16-17 (Odd)	
43	Write a program in C for sorting N positive integers in Ascending order	16-17 (Even)	23-33
44	Write a C program to sort set of integers in ascending order by using bubble sort technique.	17-18 (Even)	23-33
45	Write the importance of sorting in problem solving .Write a program in C using bubble sort technique to sort 10 numbers entered by the user.	18-19 (Even)	23-33
46	What do you mean by sorting ?Write a program in C to sort 'n' positive integers using bubble sort.Also draw the flow chart for the same.	19-20 (Odd)	23-33
47	Define sorting algorithm with example.	20-21 (Odd)	23-33
48	Explain selection sort technique for sorting problem. Write an algorithm for selection sort. Sort the following numbers using selection sort technique 26,54,93,17,77,31,44,55,20	18-19 (Odd)	23-33
49	Explain Selection sort with example.	20-21 (Odd)	23-33
50	What do you mean by order of complexity? Explain various notions to represent order of complexity with diagram.	18-19 (Odd)	23-33

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